May 9.

The President, Dr. Ruschenberger, in the chair.

Twenty-six members present.

The following papers were presented for publication:—

"Fourth Contribution to the History of Existing Cetacea," by Edw. D. Cope.

"Zoological and Biological Methods of Research," by Harrison Allen, M.D.

Remarks on Fossils from the Ashley Phosphate Beds.—Prof. Leidy observed that the so-called phosphate beds of Ashley River, South Carolina, were remarkable for the singular admixture of multitudes of fossils of different ages, from the early tertiary period inclusive down to the present epoch. The phosphatic nodules, for which the beds are explored, appear to have had their origin from the eocene rocks beneath. These have also contributed numerous remains of marine vertebrates especially of squalodonts, reptiles, and fishes. Mingled in the sand and clay with the phosphatic nodules and bones of eocene animals, are innumerable remains of cetaceans, sharks, and other marine animals of perhaps the middle and later tertiary ages. Added to these are multitudes of remains of both marine and terrestrial animals of the quaternary period. Pell-mell are found together bones of eocene squalodonts, animals related with the whales and seals; hosts of teeth of the great shark Carcharodon angustidens; myriads of the teeth of the giant of sharks of the tertiary period, the Carcharodon megalodon; bones and teeth of whales and porpoises; and abundance of remains of elephant, mastodon, megatherium, horse, etc.; and occasionally the rude implements of our more immediate ancestors.

From among a collection of fossils, from the Ashley phosphate beds, recently submitted to his inspection by Mr. J. M. Gliddon, of the Pacific Guano Company, the specimens were selected which lie upon the table. One of these is a well-preserved tooth of a Megatherium; another, a characteristic portion of the skull of a Manatee; a third, a complete tusk of the Walrus; indicating a still further point south for the extension of this animal than had been previously known; fourth, a huge tooth of a cetacean allied to the sperm whale, probably the same as those from the crag of Antwerp ascribed to Dinoziphius. Besides these there are the beaks of three cetaceans of the little known family of the Ziphioids. These are porpoise-like animals without teeth in the upper jaw, and usually with but a single pair of teeth in the lower jaw. The beaks composed of the co-ossified bones of the face are remarkable for their

ivory-like density which probably rendered them available as weapons of defence.

A fourth beak from the same locality, presented by Mr. C. S. Bement, belongs to a different species of the same family. The beaks and some associated fossils will form the subjects of a paper shortly to be presented to the Academy.

The beaks have been referred to species with the following names and brief distinctive characters:—

Chonoziphius trachops.—Supra-vomerian canal open. Intermaxillaries co-ossified and forming a crest along the middle of the beak extending to the interval of the prenareal fossæ. Maxillaries with a rugged tract at the upper part of the base of the beak.

Chonoziphius liops.—Beak proportionately of less length than in the preceding. Supra-vomerian canal and intermaxillaries the same, except that the crest of the latter in front is acute. Maxillaries without the rugged tract at base.

Eboroziphius coelops.—A new genus as well as species. Beak above forming a broad gutter as in Hyperoodon, and not divided by an intermaxillary crest as in the preceding. Maxillaries with prominent lateral crests at base, convex inwardly. Right prenareal fossa occupied by a thick osseous disk. Intermaxillaries co-ossified. Supra-vomerian canal open.

Belemnoziphius prorops.—Beak solid, with all traces of the original separation of the constituent bones and the ossified mesethmoid cartilage obliterated.

Fish Remains of the Mesozoic Red Shales.—Prof. Leidy remarked that the remains of life of any kind were exceedingly rare in the mesozoic red shales which cross our State about fifteen miles north of us. Hence any fossils whatever from these rocks were of interest. The three cycloid fish scales, and a few detached caudal rays, in the fragments of red shale, presented by him this evening, he found on the Perkiomen Railroad, near Yerkes' Station, Montgomery County. One of the scales resembles those described by the late Prof. E. Emmons, under the name of Rabdiolepis elegans, from the mesozoic coal shales of Chatham Co., N. C.

Botanical Correspondence of Zaccheus Collins.—Mr. Redfield called the attention of the members to the volume of letters of Zaccheus Collins which had been recently arranged and bound. Mr. Collins was well known in his day as an active philanthropist and as a zealous cultivator of natural science. He was early a member of the American Philosophical Society, was elected a member of the Philadelphia Linnæan Society, in 1809, before this Academy was founded, became a member of our Academy in March, 1815, and was one of its Vice-Presidents at the time of his death in 1831. He devoted himself especially to the sciences of Botany and Mineralogy, and the letters of the most eminent botanists of that time show how highly they valued his know-

ledge, and how eagerly they sought his advice upon all doubtful questions in their science. Mr. Nuttall complimented him—by naming for him the genus *Collinsia*—containing some plants of exquisite beauty, and now represented by eleven North American species, mostly Californian, but of which the earliest known was discovered in the valley of the Ohio.

The volume now before us contains an unbroken series of sixty letters from Rev. Henry Muhlenberg, of Lancaster, to whom American botany has been so much indebted, also a correspondence with his son Fred. Aug. Muhlenberg, in which we find the history of the transfer of the Muhlenberg Herbarium to the American Philosophical Society. There are also numerous letters from Stephen Elliott, author of a sketch of the Botany of South Carolina; from Dr. Jacob Bigelow, author of Florula Bostoniensis, and still surviving; from Dr. Wm. P. C. Barton, author of the Compendium Floræ Philadelphicæ; from Dr. Wm. Baldwin, the talented and lamented young botanist, who died upon Long's Exploring Expedition; from Nuttall, Torrey, Leconte, Sr., and many others well known to the scientific world.

It cannot be expected that these letters of sixty years ago can add any new botanical facts to our stock; but they have great interest as illustrating the early history of botanical science in our land, and as revealing to us the obstacles which the students of that day encountered in the scarcity of books, and in the difficulty of communication.

Mineralogical Notes; Hydrotitanite, a New Mineral.—Dr. George A. Kœnig communicated the results of an investigation on a changed *garnet* and a changed *perowskite*, from Magnet Cove, Arkansas. A short time ago he had called the attention of the Academy to the occurrence of opaque nuclei observable in microscopic slides of garnets, in which by analysis 6 per cent. of titanic acid was found. He had obtained recently, through the kindness of Dr. Foote, a fragment of a garnet crystal weighing about three ounces, on which the faces of the dodecahedron are visible, and concentrically a nucleus, contrasting by its bright pitchy lustre with the dirty circumferential part of the crystal. The line of contact is apparently very well defined, but on producing on it a fresh fracture, no difference in color and lustre and no line of division can be seen. The streak of the centre is reddish-gray, that of the circumference light greenish-gray. Starting with the hypothesis of a gradual change from inside towards the outside, or, *vice versa*, a cut was made through the crystal, about parallel with one of the principal planes of symmetry, and thus a slice was obtained half an inch thick; this was divided radially into three sections, and one of these was cut into five parts at equal distances from the centre. On reducing the pieces to powder, each by itself, a very gradual change in color was noticeable from the reddish-gray of the central part to the greenish-

gray of the circumference. 0.5 gr. of each sample was fused with 5 grs. of sodium hydro-sulphate, the solution reduced with hydrogen sulphide, after filtration, diluted to 700 c. c. of volume and boiled. Numbering the samples 1, 2, 3, 4, 5 from centre to circumference, the author obtained precipitates by boiling, of respectively 25.00, 16.2, 9.2, 6.0, and 5.0. These precipitates were titanic acid with normal reactions in numbers 3, 4, and 5; very abnormal in number 1, and less in number 2. The description of the purely chemical investigation into the nature of those abnormal reactions will be reserved for a future memoir.

In order to obtain more light upon the cause of this gradual decrease of titanic acid from centre to circumference, one of the sectors was ground to a microscopic section, which showed a banded structure at the circumference with a few opaque crystalline fragments imbedded, but besides this the material appeared homogeneous, the color only changing from light-brown, very gradually into black opaqueness. Had the banded structure continued to the core, the explanation might be looked for in the growing of the crystal at intervals in solutions of different composition, but the change being so gradual, the author is inclined to believe in a metamorphic action from the centre. The chemical fact that titanic acid does not replace one or two of the constituents, as revealed by further investigation, but that silicon, iron, and calcium diminish in the same proportion as titanic acid increases, speaks in favor of the metamorphosis by intrusion of titanic acid.

The crystals of perowskite, pure octahedrons, or octahedrons modified by the cube, are often found to have yellowish-gray spots much softer than the rest of the mineral, and, in some instances, the whole crystal is composed of the same yellowish-gray substance. The specific gravity of one of these crystals was found to be 3.681; nearly 0.2 less than the fresh mineral. An analysis of the same made with 0.5 gramme, gave the following:—

TiO_2	=	82.82
Fe_2O_3	=	7.76
MgO	=	2.72
CaO	=	0.80
H_2O	=	5.50
Vd		Undetermined, but distinct reaction.
		99.60

By metamorphic action nearly all the calcium and some iron have been removed, and water added. The result is a new mineral for which the name *Hydrotitanite* is herewith proposed if the analysis of more specimens should prove the constancy of the composition.

On the Microscopic Observation of Minute Objects. — Prof. FRAZER remarked, that he desired simply to put on record a thought relating to Helmholtz's now famous establishment of the limit of vision through the microscope. As this limit was determined by half the length of a wave of light and since the wave-lengths of the most refrangible rays of the light spectrum (*i. e.* the violet) are somewhere near the 1-57000th part of an inch, the conclusion was reached that nothing more minute than the 1-114000th part of an inch could be seen. But actinic waves or others of smaller length (of greater refrangibility too) in passing through a substance on which are lines or other markings less than 1-114000th inch apart, may be altered to light waves, and become visible, provided, that the substance through which they pass is capable of fluorescing, *i. e.*, increasing their wave length, and provided the distance apart of the marks to be seen is not less than one-half the wave length of such actinic waves.

The meeting having adjourned until May 16, the following were then elected members of the Council:—

For three years—Edw. S. Whelen, R. S. Kenderdine, M.D., J. H. Redfield, J. G. Hunt, M.D.

For two years—Geo. H. Horn, M.D., Jos. Wharton, Jos. Jeanes, Geo. A. Kœnig.

For one year—Geo. Vaux, J. S. Haines, W. H. Dougherty, Harrison Allen, M.D.

MAY 16.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-four members present.

The "Sleep of Plants" as an Agent in Self-Fertilization.—Mr. THOMAS MEEHAN said that what is popularly known as the "sleep of plants," the closing of some kinds of flowers at nightfall, though a matter within common observation, had not, so far as he was aware, been made a subject of physiological investigation, with the view of ascertaining the value, if any, of this kind of motion in the economy of plant life. He had recently discovered that by means of this peculiar motion the common Claytonia Virginica and some butter-cups were fertilized by their own pollen. The fertilization of these plants had been somewhat of a mystery to him, as, in view of some prevailing theories of cross-fertilization by insect agency, these plants ought not to be self-fertilizers; but from repeated observation he was satisfied that no insects had visited plants that had yet seeded abundantly. Watching the process of fertilization in Claytonia, he found the stamens on